

craters of elevation ; and, lastly, the elevation of a permanent volcano in the crater of elevation, or among the *débris* of its earlier formation. At different periods, and in different degrees of activity and force, the permanent volcanoes emit steam, acids, luminous scorïæ, or, when the resistance can be overcome, narrow, band-like streams of molten earths. Elastic vapors sometimes elevate either separate portions of the earth's crust into dome-shaped unopened masses of feldspathic trachyte and dolerite (as in Puy de Dome and Chimborazo), in consequence of some great or local manifestation of force in the interior of our planet, or the upheaved strata are broken through and curved in such a manner as to form a steep rocky ledge on the opposite inner side, which then constitutes the inclosure of a crater of elevation. If this rocky ledge has been uplifted from the bottom of the sea, which is by no means always the case, it determines the whole physiognomy and form of the island. In this manner has arisen the circular form of Palma, which has been described with such admirable accuracy by Leopold von Buch, and that of Nisyros,\* in the Ægean Sea. Sometimes half of the annular ledge has been destroyed, and in the bay formed by the encroachment of the sea corallines have built their cellular habitations. Even on continents craters of elevation are often filled with water, and embellish in a peculiar manner the character of the landscape. Their origin is not connected with any determined species of rock : they break out in basalt, trachyte, leucitic porphyry (somma), or in doleritic mixtures of augite and labradorite ; and hence arise the different nature and external conformation of these inclosures of craters. No phenomena of eruptions are manifested in such craters, as they open no permanent channel of communication with the interior, and it is but seldom that we meet with traces of volcanic activity either in the neighborhood or in the interior of these craters. The force which was able to produce so important an action must have been long accumulating in the interior before it could overpower the resistance of the mass pressing upon it ; it sometimes, for instance, on the origin of new islands, will raise granular rocks and conglomerated masses (strata of tufa filled with marine plants) above the surface of the sea. The compressed vapors escape through the crater of elevation, but a large mass soon falls back and closes the opening, which had been only formed by these manifestations of force. No volcano can, therefore,

\* See the interesting little map of the island of Nisyros, in Ross's *Reisen auf den Griechischen Inseln*, bd. ii., 1843, s. 69.